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SUBMARINE TORPEDO LAUNCHING CAPABILITIES (U)

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FOREWORD

This document contains a summary of known submarine operating limitations which apply during torpedo launchings and wire payout. The data shown herein were obtained from specific test programs conducted by the Naval Underwater Weapons Research and Engineering Station (NUWS) to determine limits, from miscellaneous tests aboard new submarines during Torpedo Tube Acceptance Trials, and from certain publications such as COMSUBPAC INST. 08500.1D which are believed to represent Fleet experience.

Since it is impractical to conduct specific programs to obtain all the possible combinations of conditions which may limit either the submarine or the torpedo, it is expected that the Fleet will further define launching capabilities and limitations with experience. The Fleet is requested to aid in the required periodic up-dating of this publication by forwarding comments and valid data to NUWS with as complete a description as is feasible of the conditions surrounding an unsatisfactory launch or an unusual successful launch.

Factors affecting satisfactory launching of torpedoes are submarine speed, rates of diving and climbing, tube location, tunnel and shutter configuration, tube impulse velocity, torpedo gyro and depth settings, and swimout velocity. The most important factor is submarine speed. Specific test programs conducted by NUWS determined the maximum vessel speed compatible with successful torpedo launching. The speed limits presented are valid with the submarine steaming straight on an even keel, with the torpedo set to run at the same depth as the submarine or deeper, and with a gyro angle of not more than 10° when firing across the bow from canted tubes (for example; to port from a starboard tube). When firing wire-guided torpedoes from bow tubes (parallel, non-canted), an initial gyro angle setting of at least 10° outboard away from ship's track (for example; 10° to starboard from a starboard tube) should be used as a wire clearing maneuver to help prevent the submarine's running into wire being payed out by the torpedo; after launch, the torpedo can then be stepped back to whatever course is desired, but should never be brought back across the bow if the torpedo running depth is shallower or the same as that of the submarine. The wire clearing maneuver is not required for canted tubes, as the cant angle provides it.

Wire-guided torpedoes should be deliberately impulsed only with the flexible hose. However, impulsing can be used to clear the tube of a torpedo swimming out, which has hung up; the wire will probably break.

For reliable hose release and tube clearance at the end of a run, the minimum submarine speed should be 5 knots.

The following paragraphs describe the degree of experience with the different classes of submarines and provide a basis for the speed limits listed.

Torpedo Mk 37 Mod 0

SSB(N)608, SSB(N)616 and SS(N)594 Classes - The most experience has been gained in swimout launching the Torpedo Mk 37 Mod 0 from these submarine classes. Specific test programs to determine the degree of compatibility between torpedo and ship were undertaken during construction, and continued through the introduction of these classes into the Fleet. Subsequently, during Torpedo Tube Acceptance Trials, the speed limits listed in the tables have been confirmed for each tube in each class a minimum of twelve times. These limits continue to be verified during current Weapon System Accuracy Trials.

SSB(N)598 and SS(N)585 Classes - Swimout launchings of Torpedo Mk 37 Mod 0 from these classes were conducted as specific programs to determine maximum speed capability. The programs took place after the completion of construction and Torpedo Tube Acceptance Trials, so that little opportunity was available for repeated confirmation. The limits shown in the tables were verified from each tube type an average of three times.

Torpedo Mk 45

World War II and Similar Hull Submarines - Swimout and impulse launchings of the wire-guided Torpedo Mk 45 have been infrequent due to the small quantity of these torpedoes issued to date. OPEVAL results published in 1960 by COMPTEVFOR recommend less than a 7-knot submarine speed for both impulse and swimout modes. A 6-knot limit is therefore listed in the tables. Since these tests were made by USS BLENNY (SS 324), results can only apply to World War II and similar hull types.

Albacore Hull Types - No controlled tests to determine compatible speed limits are known to have been made for these classes. The 5-knot figure listed in the tables reflects the recommendation made in COMSUBPAC INST. 08500.1D. Based on experience with Torpedo Mk 37 Mod 0, it appears that 5 knots is a reasonably safe limit until specific tests can be made. No limit is shown for the 580 class because no tests have been made. Because of the 45° angle between the tube centerline and hull tangent and the relatively extreme length of the torpedo tube extensions on this class, extrapolation of data from other classes would be hazardous.

Torpedo Mk 37 Mods 1 and 2

World War II and Similar Hull Submarines - As in the case of Torpedo Mk 45, data for the wire-guided Torpedo Mk 37 Mods are limited to OPEVAL results published by COMPTEVFOR in 1961. The Fleet is currently using a speed limit of 3-6 knots during launch. This limit applies to World War II hull types only.

Albacore Hull Types - With the exception of the 594 class, no limits are shown for Albacore hulls because no specific programs to determine limits have been made. Very limited tests aboard the SS(N) 607 indicate a speed limit of 6 knots for all tubes at launch and during wire payout, without the use of the flexible hose.

Wire - Guided Torpedoes in General

All Hull Types - Development of a flexible hose wire payout system for these torpedoes has been completed. This system permits higher submarine speeds during the torpedo run. Speed limits have been established and are noted herein, based on Fleet evaluation of the flexible hose payout system. Most tests have been with a 150-foot hose. Use of a 200-foot hose (594 class) resulted in a further significant increase in submarine speeds attained after launch. The 200-foot length has been adopted as standard, but most limitations listed are still based on tests using the 150-foot length due to lack of 200-foot tests.

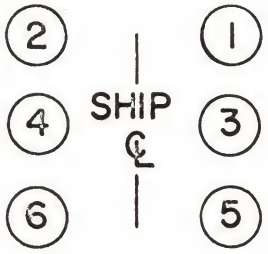
Torpedoes Mk 14 Mod 5 and Mk 16

All Hull Types - Except for the 594 class, a 14-knot figure is listed in the tables for Torpedoes Mk 14 Mod 5 and Mk 16 on the basis of tests from a limited number of classes. A small number of successful launchings have been made from some tubes of the 594 and 616 classes at speeds above 20 knots, but the limited launchings (only two) at high speed from the SSB(N)608/616 class prevent recommending more than 14 knots at this time.

Submarine Class:
Fleet Type (World War II)

Hull No.:

Forward Tube Arrangement:



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	12	N. A.
Mk 16 Mod 8	12	N. A.
Mk 37 Mod 0	12	8
Mk 37 Mod 1	--	3-6*
Mk 45	6	6

Remarks:

*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	10	10	12	12	12	12
Turn (stern away from wire)	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks:

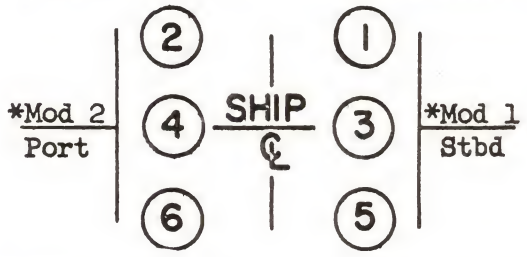
Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed.

Submarine Class:
563 (TANG)

Hull No.:
SS 563, 564, 565, 566, 567, 568

Forward Tube Arrangement:

Mk 43/45 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N.A.
Mk 16 Mod 8	14	N.A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	3-6**
Mk 45	6	6

Remarks:
**6.5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course+	10	10	12	12	12	12
Turn (stern away from wire)+	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks: +These limits are based on evaluations of the flexible hose system conducted from Fleet-type submarines. Fugure evaluations from this class, which has a greater speed capability, may increase the submarine speed allowable for launching and during wire payout.

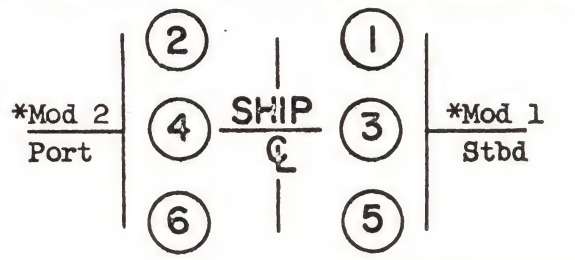
Notes: N.A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed.

Submarine Class:
571 (NAUTILUS)

Hull No.:
SS(N) 571

Forward Tube Arrangement:

Mk 50 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N.A.
Mk 16 Mod 8	14	N.A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	3-6*
Mk 45	6	6

Remarks:
*6.5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course+	10	10	12	12	12	12
Turn (stern away from wire)+	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks: +These limits are based on evaluations of the flexible hose system conducted from Fleet-type submarines. Future evaluations from this class, which has a greater speed capability, may increase the submarine speed allowable for launching and during wire payout.

Notes: N.A. = not applicable.
-- = No Data

Submarine Class:

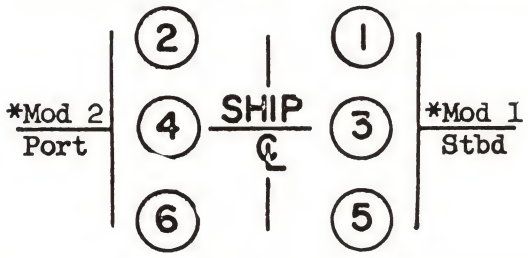
572 (SAILFISH)

Hull No.:

SS 572, 573

Forward Tube Arrangement:

Mk 49 Mod * Type Pneumatic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	3-6*
Mk 45	6	6

Remarks:

*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	10	10	12	12	12	12
Turn (stern away from wire)	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

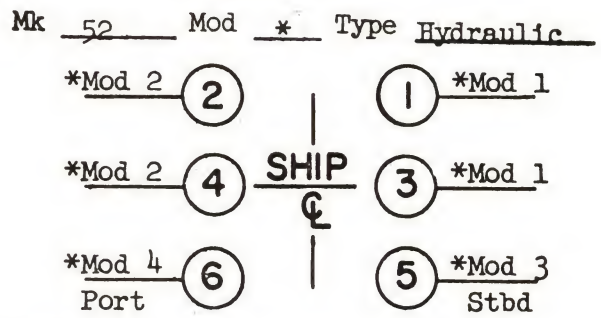
Remarks:

Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
574 (GRAYBACK)

Hull No.:
SSG574

Forward Tube Arrangement:



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	--*
Mk 45	6	6

Remarks:

*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	10	10	12	12	12	12
Turn (stern away from wire)	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks:

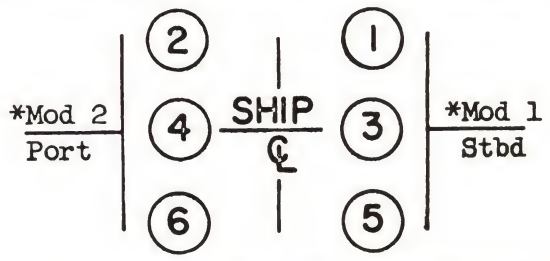
Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed.

Submarine Class:
575 (SEAWOLF)

Hull No.:
SS(N) 575

Forward Tube Arrangement:

Mk 51 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	--*
Mk 45	6	6

Remarks:

*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	10	10	12	12	12	12
Turn (stern away from wire)	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

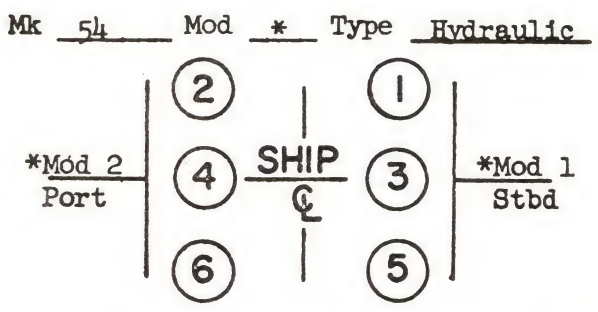
Remarks:

Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
576 (DARTER)

Hull No.:
SS 576

Forward Tube Arrangement:



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	--*
Mk 45	6	6

Remarks:

*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	10	10	12	12	12	12
Turn (stern away from wire)	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks:

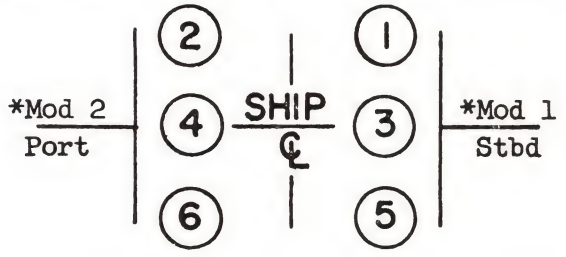
Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed.

Submarine Class:
578 (SKATE)

Hull No.:
SS(N) 578, 579, 583, 584

Forward Tube Arrangement:

Mk 56 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	5*
Mk 45	5	5

Remarks:
*6. 5 knots when using the flexible hose wire payout system. Maximum launch speed with this system is presently unknown, but is assumed to be higher. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire does not become entangled on any submarine appendages.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course+	10	10	12	12	12	12
Turn (stern away from wire)+	10	10	12	12	12	12
Turn (stem across wire)	9.5	9.5	9.5	9.5	9.5	9.5
Depth Change (standard dive and climb rate)	9.5	9.5	9.5	9.5	9.5	9.5

Remarks: +These limits are based on evaluations of the flexible hose system conducted from Fleet-type submarines. Future evaluations from this class, which has a greater speed capability, may increase the submarine speed allowable for launching and during wire payout.

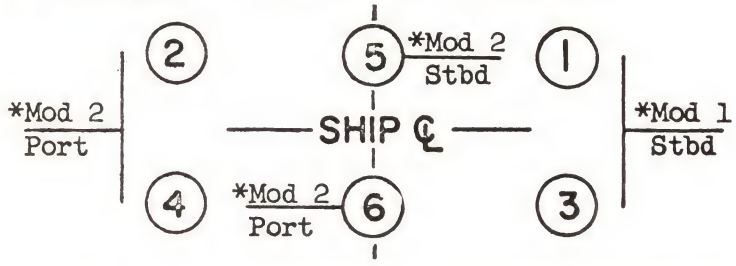
Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed; however, high vessel speed may partly empty the aft tubes, preventing successful swimout launch when the submarine is on the surface.

Submarine Class:
580 (BARBEL)

Hull No.:
SS 580, 581, 582

Forward Tube Arrangement:

Mk 58 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	--
Mk 37 Mod 1	--	--*
Mk 45	--	--

Remarks:

*When using the flexible hose wire payout system: 6 knots from tubes 1, 2, 5, and 6; 4 knots from tubes 3 and 4 (submarine on straight course). A minimum torpedo gyro angle setting of 010° is required at launch to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase. Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	13	11	19	17	16	--**
Turn (stern away from wire)	No data.					
Turn (stem across wire)	No data.					
Depth Change (standard dive and climb rate)	No data.					

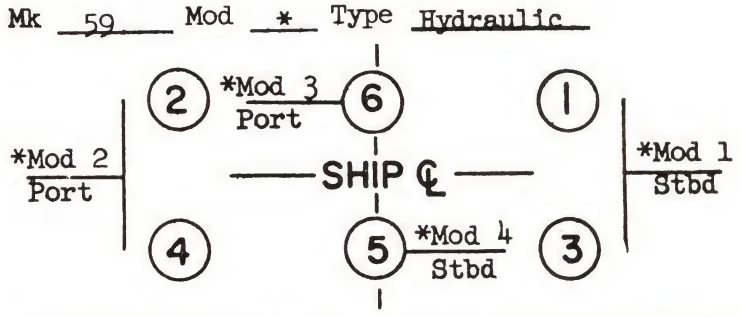
Remarks: **Insufficient valid data available to establish a limit.

Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
585 (SKIPJACK)

Hull No.:
SS(N) 585, 588, 589, 590, 591, 592

Forward Tube Arrangement:



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	4-20*
Mk 37 Mod 1	--	--**
Mk 45	5	5

Remarks:

*Tube 1 and 2 = 6 knots (8 knots on SS(N)591). Tube 3 and 4 = 4 knots. Tube 5 = 8 knots (18 knots on SS(N)589 and 591). Tube 6 = 20 knots.

**When using the flexible hose wire payout system: 6 knots from tubes 1, 2, 5, and 6; 4 knots from tubes 3 and 4 (submarine on straight course). A minimum torpedo gyro angle setting of 010° is required at launch to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	13	11	19	17	16	--‡
Turn (stern away from wire)	No data.					
Turn (stem across wire)	No data.					
Depth Change (standard dive and climb rate)	No data.					

Remarks: ‡ Insufficient valid data available to establish a limit.
Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

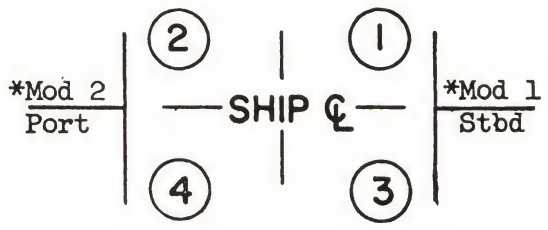
Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
586 (TRITON)

Hull No.:
SS(N) 586

Forward Tube Arrangement:

Mk 60 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	5
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	--**
Mk 45	--	--

Remarks:

**When using the flexible hose wire payout system: 6 knots from tubes 1 and 2; 4 knots from tubes 3 and 4 (submarine on a straight course). Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	13	11	19	17
Turn (stern away from wire)	No data.			
Turn (stem across wire)	No data.			
Depth Change (standard dive and climb rate)	No data.			

Remarks:

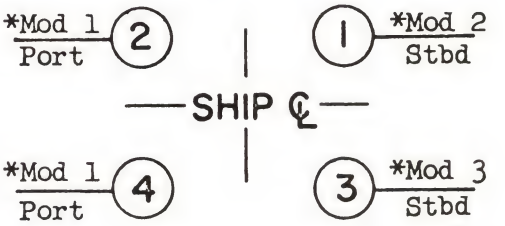
Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed; however, high vessel speed may partly empty the aft tubes when the submarine is on the surface, preventing successful swimout launch and making impulse launch extremely hazardous.

Submarine Class:
587 (HALIBUT)

Hull No.:
SSG(N) 587

Forward Tube Arrangement:

Mk 61 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	5
Mk 37 Mod 0	14	8
Mk 37 Mod 1	--	--**
Mk 45	--	--

Remarks:

**When using the flexible hose wire payout system: 6 knots from tubes 1 and 2; 4 knots from tubes 3 and 4 (submarine on a straight course). Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up. A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	13	11	19	17
Turn (stern away from wire)	No data			
Turn (stem across wire)	No data			
Depth Change (standard dive and climb rate)	No data			

Remarks:

Notes: N. A. = not applicable.
-- = No Data
Launching capability from aft tubes is not limited by vessel speed; however, high vessel speed may partly empty the aft tubes, preventing successful swimout launch when the submarine is on the surface.

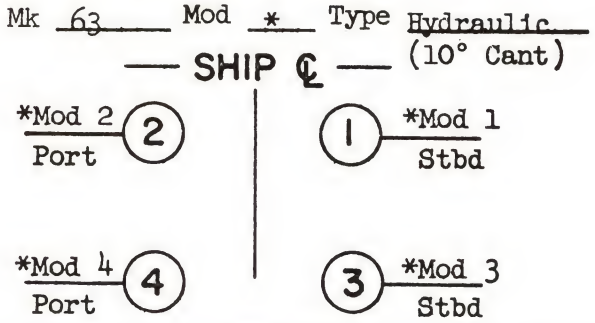
Submarine Class:

594 (PERMIT)

Hull No.:

SS(N) 594, 595, 596, 603, 604, 605, 606, 607, 612, 613, 614, 615, 621

Forward Tube Arrangement:



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	20	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	6-12*
Mk 37 Mod 1	--	--**
Mk 45	5	5

Remarks:

*Tube 1 and 2 = 12 knots.
Tube 3 and 4 = 6 knots.
**6 knots when using the flexible hose wire payout system (submarine on a straight course or in a turn).

There is no requirement for a minimum torpedo gyro angle setting when launching a wire-guided torpedo from this class of submarine.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots)+ Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	23	20	20	23
Turn (stern away from wire)	14	9	14	14
Turn (stem across wire)	9	9	9	9
Depth Change (standard dive and climb rate)	No data.			

Remarks: +The speed limits given are based on use of a 200-foot flexible hose in the payout system.

Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

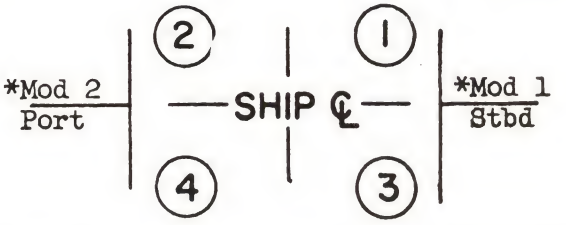
Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
597 (TULLIBEE)

Hull No.:
SS(N) 597

Forward Tube Arrangement:

Mk 64 Mod * Type Hydraulic (10° Cant)



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	--
Mk 37 Mod 1	--	--*
Mk 45	5	5

Remarks:

*6 knots when using the flexible hose wire payout system (submarine on a straight course or in a turn).

There is no requirement for a minimum torpedo gyro angle setting when launching a wire-guided torpedo from this class of submarine.

Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System (Torpedo Mk 37 Mod 1)

Submarine Maneuver	Maximum Speed (Knots)+ Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	23	20	20	23
Turn (stern away from wire)	14	9	14	14
Turn (stem across wire)	9	9	9	9
Depth Change (standard dive and climb rate)	No data.			

Remarks: +The speed limits given are based on use of a 200-foot flexible hose in the payout system.

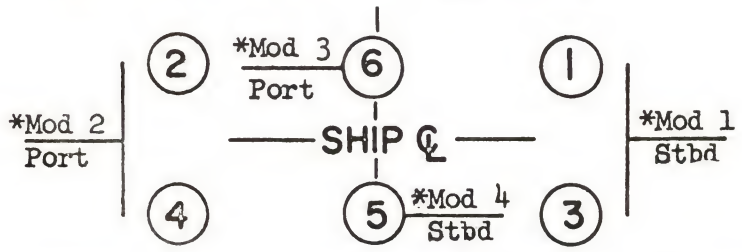
Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
598 (GEORGE WASHINGTON)

Hull No.:
SSB(N) 598, 599, 600, 601, 602

Forward Tube Arrangement:

Mk 59 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	4-20*
Mk 37 Mod 1	--	--**
Mk 45	5	5

Remarks:
*Tube 1 and 2 = 6 knots.
Tube 3 and 4 = 4 knots.
Tube 5 = 8 knots. Tube 6 = 20 knots.
**When using the flexible hose wire payout system: 6 knots from tubes 1, 2, 5 and 6; 4 knots from tubes 3 and 4 (submarine on a straight course).
A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	Tube 6
Straight Course	13	11	19	17	16	--+
Turn (stern away from wire)			No data.			
Turn (stem across wire)			No data.			
Depth Change (standard dive and climb rate)			No data.			

Remarks: +Insufficient valid data available to establish a limit.

Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

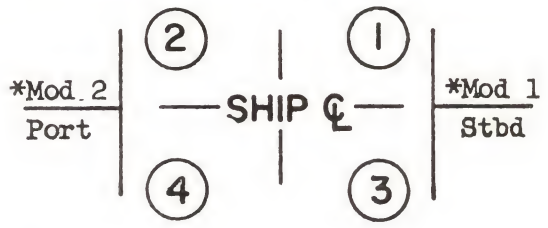
Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
608 (ETHAN ALLEN)

Hull No.:
SSB(N) 608, 609, 610, 611, 618

Forward Tube Arrangement:

Mk 65 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	6-10*
Mk 37 Mod 1	--	--**
Mk 45	5	5

Remarks:

*Tube 1 and 2 = 10 knots.
Tube 3 and 4 = 6 knots.

**When using the flexible hose wire payout system: 6 knots from tubes 1 and 2; 4 knots from tubes 3 and 4 (submarine on a straight course).
A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	13	11	19	17
Turn (stern away from wire)			No data.	
Turn (stem across wire)			No data.	
Depth Change (standard dive and climb rate)			No data.	

Remarks: Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

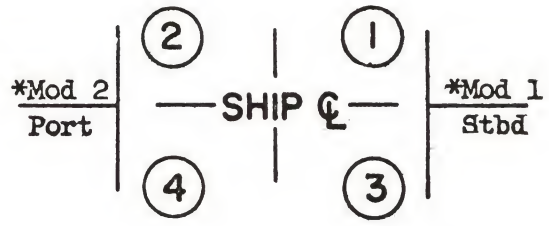
Notes: N. A. = not applicable.
-- = No Data

Submarine Class:
616 (LAFAYETTE)

Hull No.:
SSB(N) 616, 617, 619, 620, 622-636, 640-645 654-659

Forward Tube Arrangement:

Mk 65 Mod * Type Hydraulic



Limitations on Submarine Speed During Torpedo Launch:

Torpedo	Maximum Speed (Knots) Impulse	Swimout
Mk 14 Mod 5	14	N. A.
Mk 16 Mod 8	14	N. A.
Mk 27 Mod 4	14	--
Mk 37 Mod 0	14	6-10*
Mk 37 Mod 1	--	--**
Mk 45	5	5

Remarks:
*Tube 1 and 2 - 10 knots.
Tube 3 and 4 = 6 knots.
**When using the flexible hose wire payout system: 6 knots from tubes 1 and 2; 4 knots from tubes 3 and 4 (submarine on a straight course).

A minimum torpedo gyro angle setting of 010° is required to insure that the guidance wire will not be overtaken and fouled by the submarine during the initial launching phase.

Limitations on Submarine Speed After Launch when Using the Flexible Hose Wire Payout System

Submarine Maneuver	Maximum Speed (Knots) Tube 1	Tube 2	Tube 3	Tube 4
Straight Course	13	11	19	17
Turn (stern away from wire)	No data.			
Turn (stem across wire)	No data.			
Depth Change (standard dive and climb rate)	No data.			

Remarks: Do not impulse a wire-guided torpedo without flexible hose, except to clear a hang-up.

Notes: N. A. = not applicable.
-- = No Data

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